No. 8100056

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

University of Nebraska-Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF eighteen YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

GREAT NORTHERN DRY BEAN

'Harris'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this 26th day of November in the year of our Lord one thousand nine hundred and eighty-two

Attest: Kenneth A. Evans

Acting Commissioner
Plant Variety Protection Office
Grain Division
Agricultural Marketing Service

John R Block

Secretary of Agriculture

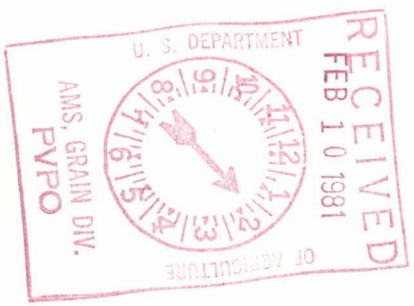
Exhibit A

Origin and Breeding History of Great Northern HARRIS Dry Bean

This information is provided in a concise form under Section II, Page 1, of the attached request (dated Jan. 19, 1980) for the release of the Great Northern HARRIS Dry Bean (formerly Early Valley).

In addition, the varietal performance (Great Northern HARRIS) and description) and seed increase are also described under sections III and IV respectively in the attached release request. The release of Great Northern HARRIS was also published in Hort Science (reprint enclosed).

Great Northern HARRIS was approved by the Vegetable Crops Varietal Release Committee of the Nebraska Agricultural Experiment Station, the Director of the Nebraska Agricultural Experiment Station, and the Vice Chancellor of the Institute of Agriculture and Natural Resources, University of Nebraska. Vice Chancellor Massengale, IANR, UNL, gave formal approval for release on February 14, 1980.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Additional Statement to Add to Exhibit A as Part of Bean Application No. 8100056, Great Northern 'Harris'

Great Northern 'Harris' is stable for the characteristics as outlined in Exhibit A. The variety has remained stable for observed characteristics during the following 4 cycles of reproduction in order to produce commercial seed; breeder, foundation, registered and certified seed classes. These increases were made in different years, starting with the initial increase of breeder seed in 1976. Commercial fields of Great Northern 'Harris', derived from certified seed, were also observed. Stability of the characteristics were observed after the initial breeder seed increase and in all subsequent seed increases mentioned above. The generation of the breeder seed increase was the first generation following the increase of 100 early maturing bulked plants made in Great Northern 'Valley' (F_7 BC_6 GN Nebraska #1 Sel. 27 X GN 1140) in 1975. No variants were observed in any of the seed increase cycles (classes of seed) mentioned above.

We have no information on the reaction of Great Northern 'Harris' to curly top virus. This virus is not a problem in Nebraska so it was not one of our breeding objectives. We cannot test for the virus in Nebraska since the vector is not present.

Dermot P. Coyne — July 30, 1982

Dermot P. Coyne
Plant Breeder

Date

PART OF EXHIBIT A

8100056

REQUEST FOR THE RELEASE OF THE GREAT NORTHERN HARRIS DRY BEAN VARIETY (EARLY VALLEY SEL.)

D.P. Coyne, David S. Nuland, and M.L. Schuster
Institute of Agriculture and Natural Resources
University of Nebraska, Lincoln, Nebraska
January, 1980

I. Suggested name: "Harris". This is an early maturing Great Northern variety with high tolerance to the bacterial pathogen, Xanthomonas phaseoli, incitant of the common blight disease.

II. Breeding procedure: The common blight tolerant Nebraska Great Northern dry bean variety 'Valley' (1) contains variants of different flowering and maturity. The homozygous and heterogenous genetic structure of the variety was purposely synthesized in order to possibly increase the variety's phenotypic stability for yield under temperature stress. The variety has performed well in growers fields and in trials. However, the presence of about 15% of late maturing plants in the variety has caused some concern since in a season with an early frost these late maturing plants could be damaged resulting in lower yields and the presence of frost damaged seeds.

One hundred early maturing plants were selected in 1975 in a field of GN Valley grown on the Mitchell Station farm of the Panhandle Station, University of Nebraska, Scottsbluff, Nebraska. Seed from these selections were bulked and some of the bulked seed were increased in the greenhouse during the Winter of 1975-76. Seed was also increased in isolation on the same farm in 1976 and in 1978.

III. Varietal performance and description: This bulked population of early plants was given the experimental designation of Early Valley and was evaluated in trials and in pilot acreage for performance.

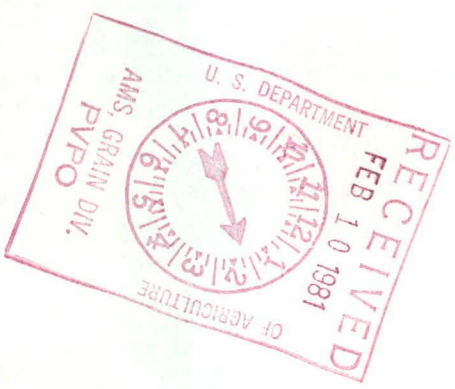
Early Valley is not a varietal name.

Early Valley was compared in trials, using randomized complete block design, during the years 1976, 1978 and 1979 with the standard Great Northern varieties and the more recent Nebraska introduced varieties to determine performance in the field and acceptability to bean dealers and growers. Eight of the trials were conducted by David Nuland and a detailed report of these tests is currently being prepared. Two trials were conducted by D.P. Coyne. All plots were irrigated.

Early Valley was similar in yield to Valley in 8 trials but in 2 trials (1978) Valley was superior in yield to Early Valley (Tables 1,2,3). Early Valley was superior in yield to the standard varieties GN UI-59 in 2 out of 10 trials and superior to GN 1140 in 4 out of 9 trials. In all other trials Early Valley was similar in yield to these 2 standard varieties except in one trial in 1978 (Table 2) GN 1140 was superior to Early Valley.

Early Valley (91 days) is similar in maturity to the standard variety GN UI-59 (91 days) and is about 8 days earlier in maturity than GN Valley (100 days) (Table 4). Early Valley should not be susceptible to frost injury in the Fall when planted in early June except in these occasional years when all varieties would be vulnerable to injury.

Common blight was detected in the trial grown in Morrill County, Nebraska, in 1978. The source of infection was in the commercial field which surrounded the experiment on all sides. All seed used in the experiment was certified as disease free. Infection appeared to be uniformly distributed throughout the entire trial. All lines were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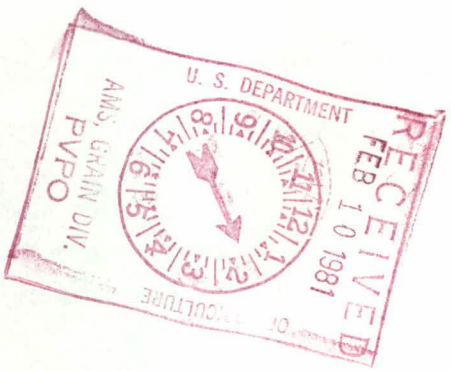
evaluated for disease symptoms on foliage on August 15 (Table 5). The blight tolerant varieties GN Tara, GN Valley, GN Star, GN Jules, and the Early Valley line showed high tolerance (disease reading 2-3) (1). The standard varieties GN 59 and GN 1140 were highly susceptible (disease reading of 3 to 5). There was no difference in mean disease ratings for GN Valley and Early Valley (1).

Dr. R. Provvidenti, (Personal Correspondence), Dept. Plant Pathology, New York State Agricultural Experiment Station, Geneva, New York State, reported that the GN Valley is resistant to the type and NY-15 strains of bean common mosaic virus (BCMV) and to the pea strain of bean yellow mosaic virus (BYMV) so that the selections we made in the variety are also resistant to these virus strains. This information was not reported in the release of GN Valley.

In summary the main advantage of the Early Valley breeding line is earlier and more uniform maturity than GN Valley and this characteristic should provide advantages to grower and dealer. We still need to determine if GN Valley, with its longer flowering period, will provide a more stable yield performance than Early Valley, with a shorter flowering period, over a long period of time. The high common blight tolerance of the variety should enable the production of certified seed of the variety in Nebraska and reduce losses due to this disease in commercial fields.

IV. Seed Increase: Foundation seed was increased from breeder seed at the Panhandle Station, University of Nebraska, Scottsbluff, Nebraska. The total amount of Foundation Seed available is approximately 3,000 pounds. Certified seed of "Harris" will be produced in Nebraska and Idaho in 1980.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Literature Cited

1. Coyne, D.P., and M.L. Schuster. 1974. Great Northern Valley dry bean. HortScience 9:482.

2. Schuster, M.L., D.P. Coyne, D.S. Nuland, and C. Christine Smith. 1979. Transmission of Xanthomonas phaseoli and other bacterial species or varieties in seeds of tolerant bean (Phaseolus vulgaris) cultivars. Plant Disease Reporter 63:955-959.

Acknowledgements

A grant received over several years from the Rocky Mountain Bean Dealers Association to support the breeding program is appreciated. We also appreciate advice and cooperation received from Dr. John Weihing, Dr. R.D. Uhlinger, Dr. J.R. Steadman, Thornton Fischer, C. Campbell, Frank Anderson and Chip Little John. The support of the growers, on whose farms David Nuland conducted the trials, is also appreciated.


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Table 1. Performance of Great Northern dry bean varieties and Early Valley breeding line in 2 trials[1/] at Scottsbluff. (Trials conducted by D.P. Coyne)

Variety/line	Years	
	1976 lbs/ac	1979 lbs/ac
TARA	2486[2/] a	1639 b
Early Valley	2475 a	1942 a
1140	2421 ab	--
Valley	2245 ab	2079 a
UI-59	2225 ab	1817 a
Nebraska #1	1988 ab	--
STAR	1976 ab	1894 a
Emerson	1913 b	--

1/ Randomized complete block design, 6 replications, single row plots 20 feet long, and rows spaced 22 inches apart.

2/ Values followed by a common letter are not significant at the 5% level, Duncan's multiple range test.

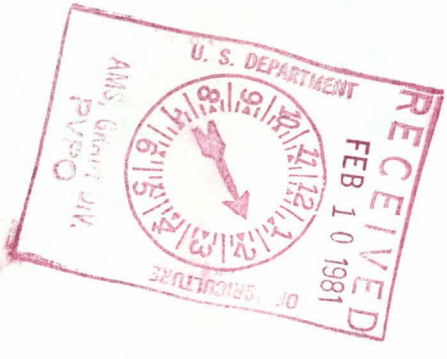
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Table 2. Yield of Great Northern varieties and breeding line Early Valley in western Nebraska (1978). (Data supplied by David Nuland.)

Variety/line	Test Locations 1/ 2/ 1	2	3	4	Mean of Four Trials	% Yield Increase Over GN UI-59
	lbs/ac	lbs/ac	lbs/ac	lbs/ac	lbs/a	
TARA	2324 bc	2775 ab	2950 a	2195 a	2561	116
Valley	2376 abc	2583 bcd	2918 a	2129 a	2501	113
Jules	2388 ab	2613 abcd	2761 a	2131 a	2473	112
Star	2201 c	2789 a	2750 a	1874 bc	2403	109
1140	2514 a	2725 abc	2360 b	1736 c	2334	106
Early Valley	2543 ab	2509 d	2347 b	1966 b	2306	104
Nebr. #1	2206 c	2540 cd	2225 b	2016 b	2247	102
UI-59	2256 bc	2487 d	2290 b	1809 c	2211	100
C.V.	5.85	5.79	7.42	6.13		

1/ The plots in these tests were six rows wide and 50' in length. The first three trials were planted in 22" rows, test four in 30" rows. Each test was replicated six times.

2/ The growers, their county, and the county agents involved with each trial are:

Trial #	County	Grower	County Agent
1	Scottsbluff Co.	Willard Loose	Monte Hendrick
2	Kimball Co.	Don Evertson	Mick Evertson
3	Morrill Co.	Dick Huck	Densel O'Dea
4	Box Butte Co.	Jerry Gardner	Roger Wilson

3/ Values with the same letter are not significantly different at the 5% level, Duncan's multiple range test.


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Table 3. Yield of Great Northern varieties and breeding line Early Valley in western Nebraska (1979). (Data supplied by David Nuland.)

Variety/Line	Test Locations 1/ 2/ 1	2	3	4	Mean of Four Trials	% Yield Increase Over GN UI-59
	lbs/ac	lbs/ac	lbs/ac	lbs/ac	lbs/a	
Early Valley	2615 a	1059 b	1793 a	2368 bc	1959	117
Jules	2454 ab 3/	1303 a	1602 ab	2459 abc	1955	117
STAR	2223 bcd	940 b	1734 a	2738 a	1909	114
Valley	2318 abc	1075 b	1697 a	2504 ab	1899	114
TARA	2467 a	994 b	1662 ab	2384 bc	1877	112
Nebr. #1	2109 cd	943 b	1673 ab	2447 abc	1793	107
UI-59	2026 cd	977 b	1520 bc	2162 c	1671	100
1140	2087 cd	795 c	1431 c	2210 bc	1631	98
C.V.	8.3	10.2	7.8	10.3		

1/ The first three tests were planted in 22" rows. The fourth test was planted in 30" rows. The plots in these tests were six rows wide, 50' long and repeated six times at each location.

2/ The grower in each county was selected and contacted by his county agent. The growers for each trial and their county agents are:

Trial #	County	Grower	County Agent
1	Scotts Bluff Co.	Larry Becker	Monte Hendrick
2	Kimball Co.	Gail Southard	David Evertson
3	Box Butte Co.	Bill Koester & Willy Wilbrand	Roger Wilson
4	Morrill Co.	Reuben Martin	Densil O'Dea

3/ Values with the same letter in each trial are not significantly different at the 5% P. level.

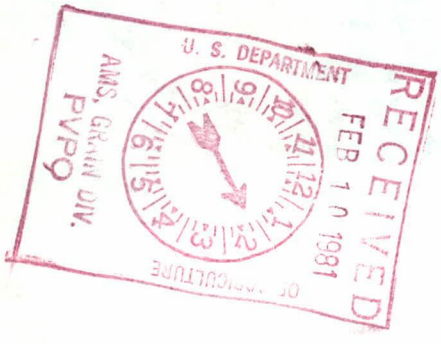
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Table 4. Number of days to maturity of two Great Northern varieties and Early Valley

Variety/line	Days to Maturity	
	Mean[1]	Range
UI-59	91	83-100
Early Valley	92	83- 98
Valley	100	89-107

[1] Mean calculated for days to maturity over eight trials conducted by David Nuland in 1978 and 1979 (See Tables 2 and 3).

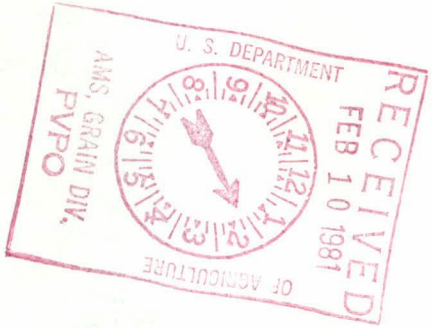
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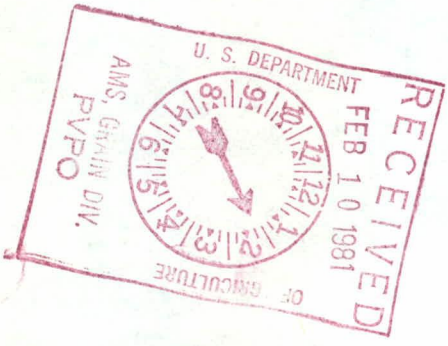
Table 5. Common blight (caused by Xanthomonas phaseoli) reaction (CBR)[y] of seven Great Northern bean cultivars and one line grown in Morrill County, Nebraska, 1978. Natural infections in six replications occurred from commercial field in which the plots were situated.

Cultivars/line	CBR	
GN Valley	2.3	c[z]
GN Early Valley (line)	2.4	c
GN Star	2.6	c
GN Jules	2.6	c
GN Tara	2.8	c
GN Nebr. #1	3.5	b
GN UI59	3.9	b
GN 1140	4.6	a

[y] Common blight reaction classes: 1 = no visible symptoms; 2 = slight to small lesions on 1-5% of leaves; 3 = moderate sized lesions on 6-25% of leaves; 4 = many large lesions on 26-50% of leaves; 5 = plants necrotic, chlorotic, large lesions on 51-100% of leaves.

[z] Means followed by a common letter are not significantly different at the 5% level, Duncan's Multiple Range Test.

Table taken from Journal article by Schuster et al., 1979, Plant Dis. Reptr., Vol. 63(11), 955-959(1).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Naming, Release and Approval for
Production of Foundation, Registered and Certified
Seed of the "Harris" (formerly Early Valley)
Great Northern Dry Bean Variety

* *

We, the members of the Vegetable Crops Varietal Release Committee of the Nebraska Agricultural Experiment Station, hereby approve the naming of Great Northern dry bean early maturing common blight tolerant Early Valley, with the name of "Harris" and recommend that Nebraska Foundation Seed Division distribute foundation seed of the variety to produce certified seed.

	Date
Dermot P. Coyne D. P. Coyne, Chairman	Feb. 11, 1980
Lloyd W. Andersen Lloyd W. Andersen, Dept. of Entomology	Feb 11, 1980
Dean Kindler Dean Kindler, Dept. of Entomology	Febr. 11, 1980
R. E. Neild Ralph Neild, Dept. of Horticulture	FEB 8, 1980
David Nuland David Nuland, Panhandle Station	Feb 5, 1980
R. B. O'Keefe Robert B. O'Keefe, Panhandle Station	Feb 6, 1980
M. L. Schuster M. L. Schuster, Dept. of Horticulture	Feb. 8, 1980
Roger D. Uhlinger Roger D. Uhlinger, Head, Dept of Horticulture Ex. Officio	2/11/80

The production and distribution of foundation seed of the early maturing common blight tolerant Great Northern dry bean Early Valley and the naming, official release of the Great Northern dry bean variety "Harris" (formerly Early Valley) is hereby approved.

Roy G. Arnold R. Arnold, Dean and Director	2/12/80 Date
M. A. Massengale Martin Massengale, Vice Chancellor	2/14/80


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PART OF EXHIBIT A 8100056

HortScience. 15(4):531. 1980

'Great Northern Harris' Dry Bean[1]

D. P. Coyne,[2] David S. Nuland,[3] M. L. Schuster,[2] and F. N. Anderson[3]
University of Nebraska, Lincoln, NE 68583

Additional index words. Phaseolus vulgars, Xanthomonas phaseoli, bean common mosaic virus, vegetable breeding

Common blight, caused by the bacterium *Xanthomonas phaseoli* (E. F. Smith) Dowson, is one of the most serious seed-borne diseases of bean, *Phaseolus vulgaris* L. Recommended controls are use of certified, disease-free seed and crop rotation; there is no satisfactory chemical control.

A common blight tolerant cultivar 'GN Valley', derived from our bean breeding program and released in 1974 (1) yielded consistently above the standard cultivar 'GN UI 59', even in the absence of common blight and has also shown high blight tolerance under natural infection in the field (1, 2). 'GN Valley' contains plants of varying dates of flowering and maturity. The homozygous and heterogenous genetic structure of this cultivar was synthesized purposely in order to increase its yield stability by spreading flowering over a longer period of time. Here we describe an early maturing bulk selection of 'GN Valley'.

[1]Received for publication March 22, 1980. Published as Paper No. 5964, Journal Series, Nebraska Agricultural Experiment Station. Research was conducted under Project No. 20-36. The authors appreciate the financial support of the Rocky Mountain Bean Dealers Association and the Green Giant Foundation, the field assistance of numerous staff at the Panhandle Station, University of Nebraska, Scottsbluff, Nebraska. The testing of the reaction of 'GN Valley' to BCMV and BYMV strains by R. R. Provvidenti, Cornell Univ., N. Y. Agr. Expt. Stat., Geneva, N. Y. is also appreciated.

The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper must therefore be hereby marked *advertisement* solely to indicate this fact.

[2]Professors, Department of Horticulture.
[3]Assist. Prof., and Assoc. Prof., respectively, Panhandle Station, Scottsbluff, Nebraska.

Origin

Seed was bulked from 100 early maturing plants selected in a field of 'GN Valley' grown on a farm at the Panhandle Station, University of Nebraska, Scottsbluff, in 1975. This bulked seed, which was designated as Early Valley bulk, was increased again in the field in 1976 and 1978 at the same location.

The cultivar name 'GN Harris' (Fig. 1) was later assigned to this bulked selection, in honor of the late Lionel Harris, former Superintendent of the Panhandle Station, University of Nebraska, Scottsbluff.

Performance and description

'GN Harris' was compared in 10 trials, using randomized complete block designs, during 1976, 1978 and 1979 with the standard GN cultivars and the new Nebraska GN cultivars. 'GN Harris' was similar in yield to 'GN Valley' in 8 trials, and lower yielding in 2 trials. The mean percent yield increase of 'GN Harris' over the standard 'GN UI 59' was 17% (1979), 4% (1978) and 11% (1976). 'GN Harris' (91 days) is similar in maturity to 'GN UI 59' and about 8 days earlier than 'GN Valley'. 'GN Harris' has the same degree of blight tolerance as 'GN Valley' (2) and is similar in seed characteristics. 'GN Harris' has less vigorous vine growth than 'GN Valley'.

Outstanding characteristics and uses

'GN Harris' is earlier and more uniform in maturity than 'GN Valley' but retains the same degree of common blight tolerance and high yielding ability. 'GN Valley' is resistant to the type strain and NY-15 strain of bean common mosaic virus (BCMV) and to the pea strain of bean yellow mosaic virus (BYMV), so that selections from that cultivar would be expected to possess this resistance (R. Provvidenti, personal communication). The high common blight tolerance of 'GN Harris' should enable the production of certified seed in Nebraska and reduce losses due to this disease in commercial fields.

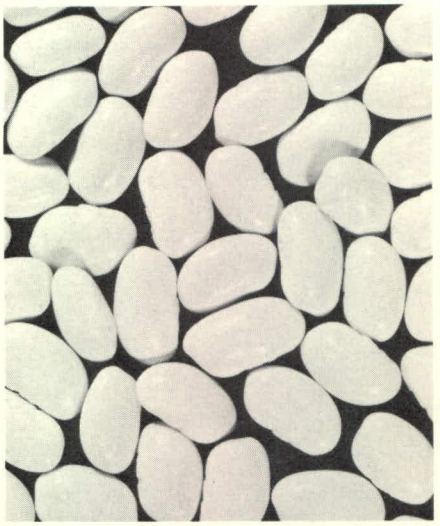

Fig. 1. Seed of 'Great Northern Harris'.

Availability

Foundation seed as well as samples for trial are distributed by the Nebraska Foundation Seed Division, University of Nebraska, Lincoln, NE 68583. We are requesting protection of this cultivar under the Plant Variety Protection Act.

Literature Cited

1. Coyne, D. P. and M. L. Schuster. 1974. 'Great Northern Valley' dry bean. *HortScience* 9:482.
2. Schuster, M. L., D. P. Coyne, D. S. Nuland, and C. Christine Smith. 1979. Transmission of *Xanthomonas phaseoli* and other bacterial species or varieties in seeds of tolerant bean *(Phaseolus vulgaris)* cultivars. *Plant Dis. Rptr.* 63:955-959.

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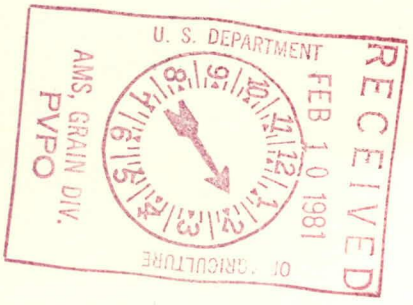
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Exhibit B

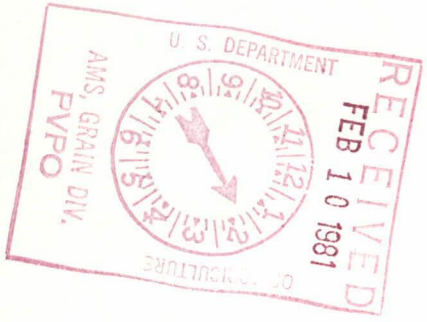
Information and data indicative of the novelty
of Great Northern HARRIS

1. The distinctive features of Great Northern HARRIS are a combination of uniformity and earliness of maturity, high common blight tolerance and high yielding ability. It is the earliest maturing Great Northern Variety with high common blight tolerance (Table A, Exhibit D). The next earliest variety with high common blight tolerance is Great Northern Star. Great Northern Nebraska #1 is slightly earlier than Great Northern HARRIS but the former only has moderate common blight tolerance (see attached reprint - Plant Disease Reporter 63:955-959, 1979 and Table A, Exhibit D). Great Northern 1140 and Great Northern UI #59 were the earliest varieties but these are highly susceptible to common blight. Great Northern HARRIS differs from the moderately common blight tolerant Great Northern Emerson in that HARRIS (32 g/100 seeds) has much smaller seed than Emerson (42 g/100 seeds). HARRIS has a uniform green pod while Emerson has a green pod with purple stripes. The leaf of Emerson is also larger and a lighter green color.

2. Great Northern HARRIS is higher yielding than Great Northern UI #59 and Great Northern 1140 but is similar in yield to Great Northern TARA, Great Northern Jules, and Great Northern Valley.

3. The main advantage of Great Northern HARRIS over Great Northern STAR is earlier maturity. HARRIS has a more crack resistant seed coat than STAR. The main advantage of HARRIS over Great Northern Valley is earlier and more uniform maturity, over Great Northern TARA and Great Northern Jules is earlier maturity, over Great Northern UI #59, Great Northern 1140, and Great Northern Nebraska #1 is higher common blight tolerance.

4. Great Northern HARRIS is probably most similar to Great Northern Valley in all traits except maturity. Great Northern Valley is variable in maturity and so is harvested late (not harvested until the late flowering plants have matured) while Great Northern HARRIS is early and uniform in maturity. A description of Great Northern Valley is reported in the attached reprint (Hort Science, Vol. 9(5), Oct. 1974).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PART OF EXHIBIT B

8100056

TRANSMISSION OF XANTHOMONAS PHASEOLI AND OTHER BACTERIAL SPECIES OR VARIETIES IN SEEDS OF TOLERANT BEAN (PHASEOLUS VULGARIS) CULTIVARS

M. L. Schuster, D. P. Coyne, D. S. Nuland, and C. Christine Smith

Department of Horticulture, University of Nebraska, Lincoln 68583.

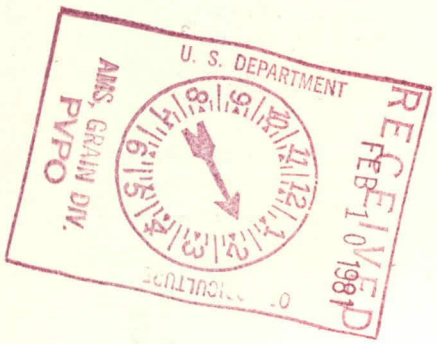
Published as Paper No. 5802, Journal Series, Nebraska Agricultural Experiment Station, Research conducted under Project 20-042.

The authors thank Garnet Blatchford for her technical assistance, Jane Walters and Blythe Stickney for their diligence in translating longhand to legible type and acknowledge financial assistance by Green Giant Foundation.

ABSTRACT

Seven Great Northern bean cultivars and a breeding line grown in replicated trials under natural conditions were examined for internal seed infection with Xanthomonas phaseoli. Detection was accomplished by soaking infected seed and then water-soak inoculating leaves of susceptible Kidney beans with the soakate. Soakate from the tolerant cultivars (GN Jules, GN Tara, GN Valley, GN Star) and an early breeding line (Early Valley) caused slight to moderate infection on 50% of the plants whereas the older established varieties had 92% of the plants exhibiting moderate to severe infection.

Plant Dis. Reptr. 63: 955-959.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Internal seed infection with bacterial pathogens among tolerant bean cultivars is a major concern of bean seed producers. Parker (9) reported that seed of a tolerant bean variety gave a positive reading for halo blight after being grown for three generations in an area with negligible incidence of halo blight. Vanette (19) found that certified bean seeds were internally infected with common blight bacteria although levels of susceptibility for the varieties were not indicated. Thomas and Graham (17) found bacterial pathogens in symptomless plants originating from certified seed. It is common knowledge that foliage and stems of tolerant bean cultivars harbor relatively high populations of pathogenic bacteria even without exhibiting easily discernible symptoms (1,8,10,14,16). This problem is further complicated by the difference in reaction of leaves and pods to common (caused by Xanthomonas phaseoli (E.F.S.) Dows.) and halo blight (caused by Pseudomonas phaseolicola (Burkh.) Dows.) bacteria (5,7). This report includes the results of seed infections with Xanthomonas phaseoli and other pathogenic bacteria of tolerant Great Northern bean cultivars under natural conditions.

MATERIALS AND METHODS

Seven Great Northern bean cultivars (GN Nebraska #1, GN 59, GN 1140, GN Tara, GN Jules GN Valley, GN Star and breeding line GN Early Valley (2,3,4,6)) were planted June 6, 1978 in a furrow-irrigated commercial field of three GN cultivars in Bayard, Nebraska. Each plot consisted of six rows 50 ft (16 m) in length with between-row spacings of 22 inches (56 cm). A randomized complete block design was used in laying out the field plots and each cultivar row was replicated six times. Good weed control was accomplished by applying S-ethyl di=propylthiocarbamate (Eptam). A good stand was obtained and the plants grew very well until common blight developed in August.

The original purpose of the experiment was to make comparative yield trials of the eight cultivars under western Nebraska conditions. Comparative disease evaluations of leaves were made of the plots on August 15, 1978.

Probable internal infections of the seeds used to plant the seven cultivars and one breeding line were evaluated by using disease ratings of 1 to 5 with 1 denoting no visible leaf infections and 5 with very severe infections. Ratings of 1.5, 2.5, 3.5, and 4.5 were also used to illustrate disease severity. Preparatory to determination of internal seed infections, seeds were surface-sterilized in 2.6% NaOCl for 3 minutes and then rinsed in sterile water. A random seed sample weighing 200 g was soaked in 300 ml water for 24 hr for each sample of seed harvested per replication (13).

The water-soakate from each of the six replicated seed samples of the seven cultivars and one breeding line was used to inoculate six Dark Red Kidney (susceptible to Xanthomonas phaseoli) plants by the water-soaking method (11). The inoculated plants were rated from 1 to 4, with 1 denoting visible infection and 4 denoting severe infection. Readings of 1.5, 2.5, and 3.5 were also used as intermediate levels of disease severity.

RESULTS

It is possible that the adjacent commercial bean field planted with infected seed or the infected debris blown in or present in the area were the sources of common blight infection (12). Infection was observed to move from the commercial field to the yield plots. Seeds of the seven cultivars and line were certified and disease-free. As recorded in Table 1, the foliage disease reactions of the field-grown tolerant cultivars GN Valley, GN Star, GN Jules, GN Tara and line GN Early Valley were slight to moderate (disease reading of 2 to 3). The older established varieties GN Nebr. #1, GN UI59, and GN 1140 were rated moderate to severe (disease rating of 3 to 5).

Cultivars GN Star, GN Jules, GN Tara, GN Valley, and line GN Early Valley showed internal seed infection with virulent common blight bacteria (Table 2). The tolerant cultivars and line showed 33, 33, 66, 68, and 50% infection, whereas the old cultivars GN 1140 and GN UI59 had 83 and 100% infection, respectively (Table 2). Seed soakates of GN 1140, GN UI59, and GN Nebr. #1 gave disease ratings of 3.2, 3.5, and 3.2, respectively. The tolerant cultivars gave disease ratings of 2.6 with 50% of plants showing infection. Contrarily, the older cultivars GN 1140 and GN UI59 showed more seed infection with a rating of 3.3 with 92% of plants infected upon inoculation with seed soakate. The tolerant cultivars showed slight to moderate infection; half as many plants were infected, compared with the higher disease ratings for the older established cultivars. GN UI59 had more seed infections than Star and Jules. Jules had less disease than Nebr. #1, GN UI59, Tara, and GN 1140. Disease infections of Nebr. #1, Valley, Star, Tara, E. Valley and GN 1140 were not significantly different (Table 2).

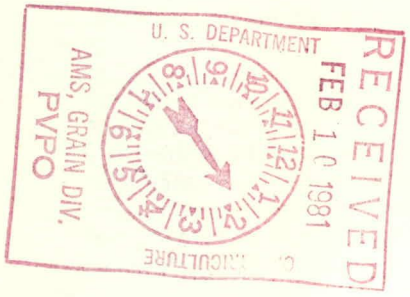
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Table 1. Common blight (caused by Xanthomonas phaseoli) reaction (CBR)[y] of seven Great Northern bean cultivars and one line grown in Bayard, Nebraska, 1978. Natural infections in six replications occurred from commercial field in which the plots were situated.

Cultivars/line	CBR	
GN Valley	2.3	c[z]
GN Early Valley (line)	2.4	c
GN Starr	2.6	c
GN Jules	2.6	c
GN Tara	2.8	c
GN Nebr. #1	3.5	b
GN UI59	3.9	b
GN 1140	4.6	a

[y]Common blight reaction classes: 1 = no visible symptoms; 2 = slight to small lesions on 1-5% of leaves; 3 = moderate sized lesions on 6-25% of leaves; 4 = many large lesions on 26-50% of leaves; 5 = plants necrotic, chlorotic, large lesions on 51-100% of leaves.
[z]Means followed by a common letter are not significantly different at the 5% level according to Duncan's Multiple Range Test.

Table 2. Detection of Xanthomonas phaseoli inside seeds of seven cultivars and a line grown in randomized complete block, 6 replications, in Bayard Nebraska, 1978. Detection by using seed soakate as inoculum for inoculating Red Kidney leaves[y].

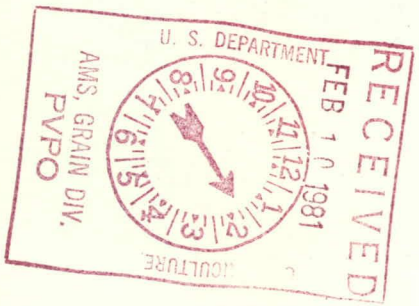
Cultivar or line	Disease reaction		% Plants infected
GN Jules	1.7	c[z]	33
GN Star	2.2	bc	33
Early Valley (line)	2.8	abc	50
GN Valley	2.8	abc	68
GN Nebr. #1	3.2	ab	100
GN 1140	3.2	ab	83
GN Tara	3.3	ab	66
GN UI59	3.5	a	100

[y]Disease reaction classes: 1 = no symptoms; 2 = slightly susceptible, small lesions on 1-5% of leaves; 3 = moderately susceptible, moderate sized lesions on 6-25% of leaves; 4 = severely susceptible, many large lesions on 51-100% of leaves with pronounced necrosis and chlorosis. [z]Means with common letter are not significantly different at the 5% level according to Duncan's Multiple Range Test.

Standardized procedures (foliage symptoms and cultural characteristics) were employed in determination of the seed isolates. From the seed lots, 34 X. phaseoli, 8 X. phaseoli var. fuscans, 3 Corynebacterium flaccumfaciens, and 1 C. flaccumfaciens var. violaceum were isolated (13). C. flaccumfaciens var. violaceum (15) was isolated from the variety GN Star and C. flaccumfaciens from cultivars Valley, Star, Jules, and line Early Valley. Of these four, GN Star was bred for tolerance to the bean wilt bacterium.

DISCUSSION

There appears to be a relationship between foliage susceptibility and internal seed infection of the tolerant and established groups of cultivars studied. The lower foliage and seed amounts of infection among the tolerant cultivars indicate that breeding for tolerance is a possible and useful technique. The selection of tolerant cultivars was originally based on foliage inoculation and reactions. Pod reactions of the tolerant cultivars need to be ascertained so that comparisons can be made between pod and seed infections.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The fact that tolerant bean cultivars can transmit blight bacteria systemically through the seed is an important consideration for the bean industry. Some of the bacteria in the seeds were macroscopically visible because of yellow coloration. Those seeds infected without visible signs, however, cannot be removed by the electronic sorting machine and those are the seeds that present serious problems to the bean seed industry. Therefore, the establishment of new bean seed-growing areas for the production of bacterial blight-tolerant cultivars or the inclusion of bacterial blight-tolerant varieties into established seed bean-growing areas, or both, need to be attempted only after there is an understanding of the problems pertinent to the venture. The best method of detection of bacterial pathogens in a seed lot should be employed to determine freedom from internal contamination. Our detection method (13) is more important and meaningful than mere detection because virulent bacteria must be present in sufficient amounts to induce infection. Bean breeders who are charged with the responsibility of making interspecific crosses should emphasize the development of lines which are truly resistant or immune to blight bacteria. They should also seek resistant germ plasm within Phaseolus vulgaris by transgressive segregation (18). Precaution must be exercised, however, because pathogenic bacteria, such as X. phaseoli, have the capability of persisting and multiplying even among resistant and immune hosts (1, 10). Although the bacterial populations in these hosts are less than in susceptible hosts, systemic infection may not occur as readily in resistant varieties. During threshing, seeds which become surface-contaminated with bacteria in the foliage can be treated with bactericide. Because tolerant and resistant cultivars can become infected under natural conditions, this knowledge has a bearing on epidemiology, dynamics of disease reactions, and adaptation of pathogens in plants.

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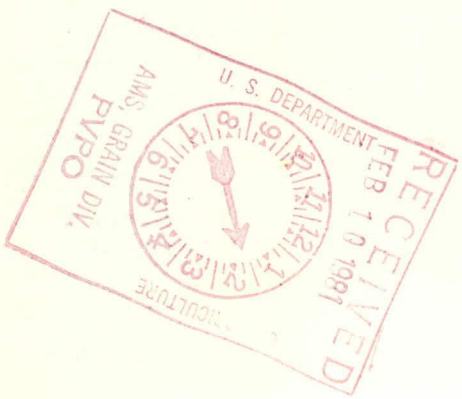
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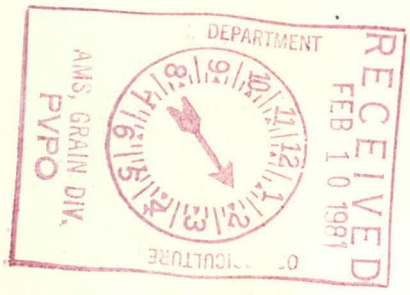
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PART OF EXHIBIT B

'Great Northern Valley' Dry Bean[1]

8100056

D. P. Coyne and M. L. Schuster[2]
University of Nebraska, Lincoln

Reprinted from HORTSCIENCE, Vol. 9(5), October 1974
A publication of the American Society for Horticultural Science, Mt. Vernon, Virginia

Common blight, caused by the bacterium *Xanthomonas phaseoli* (E. F. Smith) Dowson, is one of the most serious seed-borne bacterial diseases of beans, *Phaseolus vulgaris* L. Recommended controls are use of certified disease-free seed and rotation. There is no satisfactory chemical control. Great Northern (GN) cultivars 'Tara' (2) and 'Jules' (3) have high tolerance to *X. phaseoli* and high yield but combine the disadvantages of late maturity and vigorous vines, the latter creating conditions favorable for white mold. These 2 cultivars were derived by pedigree selection from the cross of the late maturing, common blight tolerant GN Nebraska #1 sel. 27 line with the early maturing susceptible 'GN 1140'. The reaction to *X. phaseoli* was inherited quantitatively (4) while maturity was inherited qualitatively (1). Linkage occurred between genes controlling common blight tolerance and late maturity (4).

Origin

Genes controlling early maturity in 'GN 1140' were transferred using 6 backcrosses to the recurrent parent GN Nebraska #1, sel. 27. Earliness and a high level of common blight tolerance were recombined using this breeding procedure.

Description

'GN Valley' (tested as GN Expt.-M) is similar to the standard 'GN UI #59' in plant habit, seed size, seed shape, and oven baking quality, but matures only 2 to 4 days later. Common blight tolerance of 'GN Valley' is similar to 'GN Tara' and yield is superior to 'GN UI #59' and 'GN 1140' under conditions favorable for common blight (Table 1). Yield of 'GN Valley' is comparable to standard GN cultivars in the absence or in the presence of a moderate level of this disease (unpublished data from 3 years of trials).

Outstanding characteristics and uses

'GN Valley' is considered superior to 'GN Tara' and 'GN Jules' because it matures approx a week earlier and has less vine growth. Its tolerance to *X. phaseoli* is superior to 'GN 1140' and 'GN UI #59'. The introduction of this cultivar can reduce crop losses due to disease and may permit an expansion of the bean seed industry in Nebraska.

Availability

The Nebraska Foundation Seed Division, University of Nebraska, Lincoln, Nebraska plans to produce foundation seed from 770 kg of breeder seed in 1974. Samples of seed for trial may be obtained from that source.

[1]Received for publication June 14, 1974. Published as Paper No. 3816, Journal Series, Nebraska Agricultural Experiment Station. Research was conducted under Project No. 20-3. A grant received from the bean dealers in western Nebraska to support this research is appreciated. The authors also appreciate assistance of many staff at the Panhandle Station, University of Nebraska, Scottsbluff, Nebraska.

[2]Professor, Department of Horticulture and Forestry and Professor, Department of Plant Pathology, University of Nebraska.

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Table 1. Yield, disease reaction, and no. of days to maturity of 'GN Valley' and standard cultivars 'GN 1140' and 'GN UI #59' under severe levels of common blight in 1971, 1972, Nebraska.

Cultivar	1971 Scottsbluff Tons/ha	1971 Scottsbluff (Bu/acre)	1971 Scottsbluff Tons/ha	1971 Scottsbluff (Bu/acre)	1972 Alliance Tons/ha	1972 Alliance (Bu/acre)	Disease[z] reaction	No. days to maturity
GN Valley	3.2	(46.9 a[y]	3.6	(51.2) a	1.7	(25.7) a	Tolerant	95-97
GN 1140	2.4	(35.9) b	2.2	(33.0) b	1.5	(21.7) b	Highly susceptible	87-89
GN UI #59	2.8	(41.4) b	–	–	1.5	(21.5) b	Slightly susceptible	90-95

[z]Disease reaction: tolerant-slight small lesions on about 1-5% of leaves close to maturity; slightly susceptible-lesions of various sizes on most leaves and some leaves chlorotic; highly susceptible-many large lesions on most leaves, pronounced chlorosis and necrosis.

[y]Mean separation within columns by Duncan's multiple range test, 5% level.

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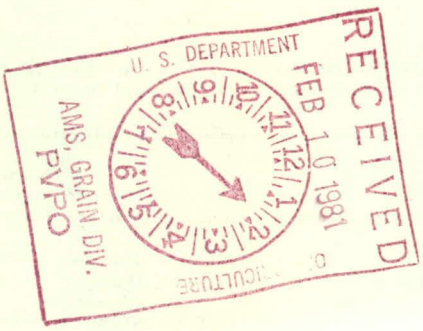
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Exhibit D

Additional Description of the Variety

The attached tables show that common blight tolerant Great Northern HARRIS is earlier in maturity than the other Great Northern varieties TARA, JULES and GN STAR that have high blight tolerance (Table A). It is the earliest Great Northern variety with high tolerance to common blight. Great Northern STAR is the next earliest Great Northern variety with high common blight tolerance. A disadvantage of STAR is the susceptibility of the seed coat to mechanical injury (Tables B and C). Great Northern HARRIS and Great Northern Valley have a much lower percentage of seed coat injury after threshing than Great Northern STAR.

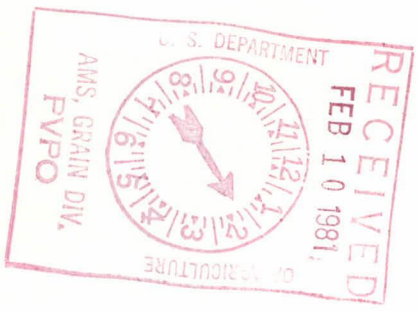
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Table A. Number of days to maturity of dry bean varieties in western Nebraska (1978 to 1980). (Trials conducted David Nuland)

Variety	1978	1979	1980
Great Northern HARRIS	84	91	94
Great Northern JULES	97	99	102
Great Northern STAR	94	99	97
Great Northern VALLEY	97	99	102
Great Northern TARA	97	99	102
Great Northern Nebr. #1	86	87	89
Great Northern UI 59	84	87	87
Great Northern 1140	84	87	90

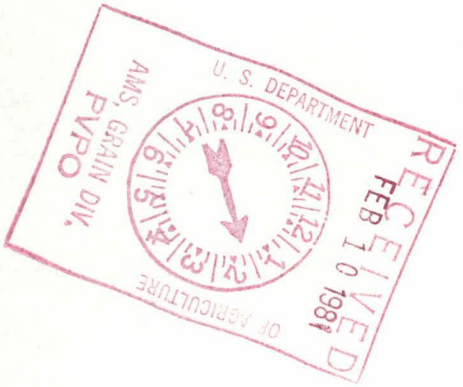
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Table B. Percent of cracked seeds of varieties in dry bean trial. Grant, Nebraska. 1978. (Trial conducted by Dr. Dale Lindgren)

Variety	Yield	% Cracked Seed[a]
Great Northern HARRIS	2080	2.8
Great Northern UI 59	2049	3.0
Great Northern STAR	2031	5.2
Great Northern VALLEY	1805	3.6

[a]The Vogel thresher was run at normal speed to thresh the seed.

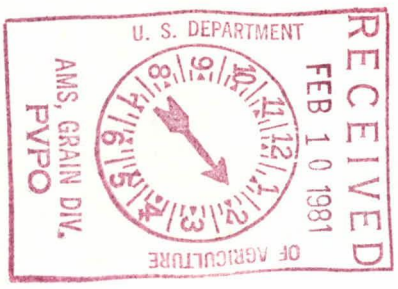
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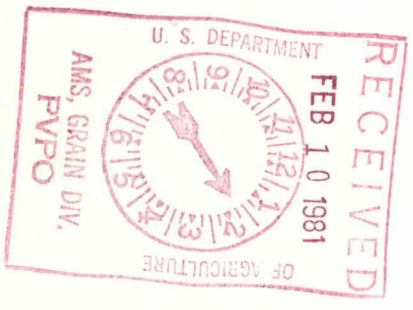
Table C. Percent of cracked seeds of varieties in dry bean trial. Scottsbluff, Nebraska. 1977. (Trial conducted by S. Korban and D.P. Coyne)

Variety	% Cracked Seed[a]
Great Northern 1140	63.7 a
Great Northern UI 59	35.7 d
Great Northern TARA	45.7 bc
Great Northern STAR	53.7 b
Great Northern VALLEY[b]	39.2 cd
Great Northern NEBRASKA #1	42.1 c

[a]The Vogel thresher was run at high speed in order to promote a high degree of seed injury. The % seed moisture was 9.8% ± 0.5.

[b]It is assumed that Great Northern HARRIS would have about the same degree of cracking as GN Valley since Great Northern HARRIS was derived by selecting within the variety Great Northern Valley. Harris and Valley had the same % of cracking in the Grant trial under normal threshing conditions (Table A).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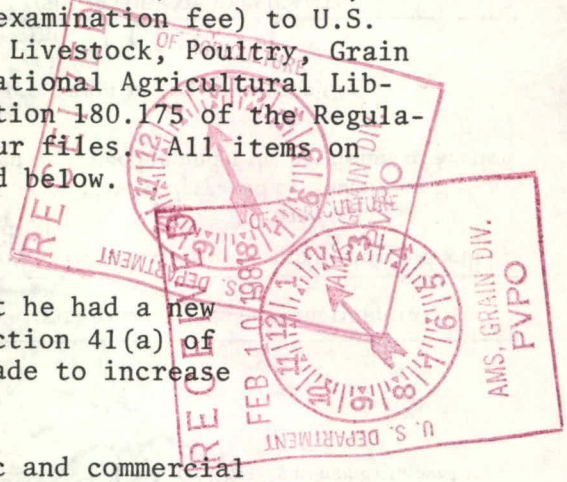
INSTRUCTIONS

GENERAL: Send an original copy of the application and exhibits, at least 2,500 viable seeds, and $500 fee ($250 filing fee and $250 examination fee) to U.S. Dept. of Agriculture, Agricultural Marketing Service, Livestock, Poultry, Grain and Seed Division, Plant Variety Protection Office, National Agricultural Library Building, Beltsville, Maryland 20705. (See section 180.175 of the Regulations and Rules of Practice.) Retain one copy for your files. All items on the face of the form are self-explanatory unless noted below.



ITEM

5 Give the date the applicant determined that he had a new variety based on (1) the definition in section 41(a) of the Act and (2) the date a decision was made to increase the seed.

13a Give: (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method; (2) the details of subsequent stages of selection and multiplication; (3) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified and (4) evidence of uniformity and stability.

13b Give a summary statement of the variety's novelty. Clearly state how this novel variety may be distinguished from all other varieties in the same crop. If the new variety most closely resembles one or a group of related varieties: (1) identify these varieties and state all differences objectively; (2) attach statistical data for characters expressed numerically and demonstrate that these differences are significant; and (3) submit, if helpful, seed and plant specimens or photographs of seed and plant comparisons clearly indicating novelty.

13c Fill in the Exhibit C, Objective Description form, for all characteristics for which you have adequate data.

13d Describe any additional characteristics that are not described, or whose description cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the description of characteristics that are difficult to describe, such as, plant habit, plant color, disease resistance, etc.

14a If "YES" is specified (seed of this variety be sold by variety name only as a class of certified seed) the applicant may NOT reverse his affirmative decision after the variety has either been sold and so labeled, his decision published, or the certificate has been issued. However, if the applicant specified "NO," he may change his choice. (See section 180.16 of the Regulations and Rules of Practice.)

15a See section 42 of the Plant Variety Protection Act and section 180.7 of the Regulations and Rules of Practice.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK, POULTRY, GRAIN & SEED DIVISION

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

INSTRUCTIONS: *See Reverse.*

FORM APPROVED
OMB NO. 40-R3822

No certificate for plant variety protection may be issued unless a completed application form has been received (5 U.S.C. 553).

1a. TEMPORARY DESIGNATION OF VARIETY	1b. VARIETY NAME	FOR OFFICIAL USE ONLY
Early Valley	Harris	PV NUMBER 8100056
2. KIND NAME	3. GENUS AND SPECIES NAME	FILING DATE 2/18/81 / TIME 1:00 A.M. P.M.
Great Northern Dry Bean	Phaseolus Vulgaris L.	FEE RECEIVED $ 500.00 $ 250.00 / DATE 2/18/81 11/15/82
4. FAMILY NAME (BOTANICAL)	5. DATE OF DETERMINATION	
Leguminosea	February 1980	

6. NAME OF APPLICANT(S)	7. ADDRESS *(Street and No. or R.F.D. No., City, State, and ZIP Code)*	8. TELEPHONE AREA CODE AND NUMBER
Agricultural Experiment Station The University of Nebraska - Lincoln	Lincoln, Nebraska 68583	(402) 472-2045

9. IF THE NAMED APPLICANT IS NOT A PERSON, FORM OF ORGANIZATION: *(Corporation, partnership, association, etc.)*	10. IF INCORPORATED, GIVE STATE AND DATE OF INCORPORATION	11. DATE OF INCORPORATION
Corporation	Nebraska	1869

12. NAME AND MAILING ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS:

Dr. Roy Arnold, Dean and Director
Nebraska Agricultural Experiment Station
University of Nebraska - Lincoln, Lincoln, NE 68583

13. **CHECK BOX BELOW FOR EACH ATTACHMENT SUBMITTED:**

- [X] 13A. Exhibit A, Origin and Breeding History of the Variety *(See Section 52 of the Plant Variety Protection Act.)*
- [X] 13B. Exhibit B, Novelty Statement.
- [X] 13C. Exhibit C, Objective Description of the Variety *(Request form from Plant Variety Protection Office.)*
- [X] 13D. Exhibit D, Additional Description of the Variety.

14a. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? *(See Section 83(a). (If "Yes," answer 14B and 14C below.)* [X] YES [ ] NO

14b. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?	14c. IF "YES," TO 14B, HOW MANY GENERATIONS OF PRODUCTION BEYOND BREEDER SEED?
[X] YES [ ] NO	[X] FOUNDATION [X] REGISTERED [X] CERTIFIED

15a. DID THE APPLICANT(S) FILE FOR PROTECTION OF THIS VARIETY IN OTHER COUNTRIES? [ ] YES [X] NO *(If "Yes," give name of countries and dates.)*

15b. HAVE RIGHTS BEEN GRANTED THIS VARIETY IN OTHER COUNTRIES? [ ] YES [X] NO *(If "Yes," give name of countries and dates.)*

16. DOES THE APPLICANT(S) AGREE TO THE PUBLICATION OF HIS/HER (THEIR) NAME(S) AND ADDRESS IN THE OFFICIAL JOURNAL? [X] YES [ ] NO

17. The applicant(s) declare(s) that a viable sample of basic seed of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.

The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in Section 41, and is entitled to protection under the provisions of Section 42 of the Plant Variety Act.

Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

1-26-81
(DATE)

Roy G. Arnold
(SIGNATURE OF APPLICANT)

1-28-81
(DATE)

M. A. Massengale
(SIGNATURE OF APPLICANT)

FORM GR-470 (1-78)

3. PLANT: (Cont'd)

[3] Pod position: 1 = low 2 = high 3 = scattered

[ ] Bush form (illustrated below):

1 = spherical bush form 2 = stem bush form 3 = wide bush form 4 = high bush form

5 = other (specify) _____

4. LEAVES:

[1] 1 = smooth 2 = wrinkled [1] 1 = dull 2 = glossy

[2] Size: 1 = small (Earliwax) 2 = medium 3 = large (Tendercrop)

[3] Color: 1 = light green (as light or lighter than Bountiful) 2 = medium green
3 = dark green (as dark or darker than Bush Blue Lake 290)

5. FLOWERS:

[1] Color: 1 = white 2 = cream 3 = pink 4 = lilac 5 = purple 6 = Other (specify)_____

[4][0] Days to 50% bloom

6. FRESH PODS: **(Edible maturity, average for 20 pods)** This is a Dry Bean

[-] Exterior color: 1 = light green (as light or lighter than Bountiful) - Not appropriate
2 = medium green
3 = dark green (as dark or darker than Bush Blue Lake 290)
4 = light yellow (Brittlewax)
5 = golden yellow (Cherokee Wax)
6 = green-red variagated (Horticultural)
7 = other (specify)

_____

% Sieve size distribution at optimum maturity for non-flat pods

Note:
1 = 4.76 mm to 5.76 mm
2 = 5.76 mm to 7.34 mm
3 = 7.34 mm to 8.34 mm
4 = 8.34 mm to 9.53 mm
5 = 9.53 mm to 10.72 mm
6 = 10.72 mm or larger

1	2	3	4	5	6

3 sieve	[ ][ ] cm length	[ ][ ] mm width	[ ][ ] mm thickness
4 sieve	[ ][ ] cm length	[ ][ ] mm width	[ ][ ] mm thickness
5 sieve	[ ][ ] cm length	[ ][ ] mm width	[ ][ ] mm thickness
6 sieve	[ ][ ] cm length	[ ][ ] mm width	[ ][ ] mm thickness

FORM APPROVED: OMB NO. 40-R3822

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK, POULTRY, GRAIN & SEED DIVISION
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(Bean)

OBJECTIVE DESCRIPTION OF VARIETY

BEAN (Phaseolus vulgaris L.)

NAME OF APPLICANT(S)

Nebraska Agricultural Experiment Station

ADDRESS *(Street and No. or R.F.D. No., City, State, and Zip Code)*

Department of Horticulture
University of Nebraska
Lincoln, NE 68583

FOR OFFICIAL USE ONLY

PVPO NUMBER 8100056

VARIETY NAME OR TEMPORARY DESIGNATION

Great Northern HARRIS

Place numbers in the boxes (e.g. [0][8][9]) for the characters that best describe this variety. Measured data should be for SPACED PLANTS. Ranges may also be given. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used: _____. The location of test area is Scottsbluff, western Nebraska. Please answer questions appropriate for your variety if the information is available.

1. TYPE:

[1] 1 = Field *(dry-edible)* 2 = Garden

2. MARKET MATURITY:

[- -] Days to edible pods - Not appropriate

[- -] Days to green shells - Not appropriate

[9 3] Days to dry seeds

[- - - -] Heat units to edible pods

[- - - -] Heat units to green shells - Not appropriate

[1 8 5 0] Heat units to dry seeds

[6] No. days earlier than Great Northern TARA

Great Northern Same as Nebraska #1

[6] No. days later than Great Northern 1140

1 = Tendercrop
2 = Kentucky Wonder
3 = Kinghorn Wax
4 = White Kidney
5 = Michelite 62
6 = Dwarf Horticultural
7 = Bush Blue Lake 290
8 = Other (specify below)

3. PLANT:

[2] 1 = Determinate 2 = Indeterminate

[4 0] cm height

[1 0] cm shorter than Great Northern TARA

Great Northern Valley Same as Dark Red Kidney

[3 0] cm taller than Charlevoix

comparison variety from above

[5 0] cm spread

[4] Number primary branches near base

[2 0] cm narrower than Great Northern TARA

Great Northern Valley width same as Dark Red Kidney

[1 5] cm wider than Charlevoix

comparison variety from above

[2] Branching habit: 1 = compact 2 = open

[2] Main stalk: 1 = brittle 2 = wirey

[2] 1 = stout 2 = thin

6. FRESH PODS: (Cont'd)

[ ] Cross section pod shape: 1 = flat 2 = oval 3 = round 4 = heart

[ ] Creaseback: 1 = present 2 = absent

[ ] Pubescence: 1 = none 2 = sparse 3 = considerable

[ ] Spur: 1 = straight 2 = slightly curved 3 = curved

[ ] Constrictions: 1 = none 2 = slight 3 = deep

[ ] Pod flesh: 1 = light 2 = medium 3 = dark

[ ][ ] mm spur length

[ ] Fiber: 1 = none 2 = sparse 3 = considerable

[ ] Number of seeds per pod

[ ] Surface: 1 = smooth 2 = rough

[ ] Suture string: 1 = present 2 = absent

[ ] Seed development (Snap Bean): 1 = slow 2 = medium 3 = fast

[ ] Machine harvest: 1 = adapted 2 = not adapted

[ ] Pod flavor: (1) Standard (Tendercrop)
(2) Mild Blue Lake (BBL 274)
(3) Strong Blue Lake (Pole FM1)
(4) Mild Romano (Roma)
(5) Strong Romano (Pole Romano)
(6) Other (specify) _____

7. SEED COAT COLOR:

[1] 1 = Monochrome 2 = Polychrome [2] 1 = shiny 2 - dull

[1] Primary color: } 1 = white 2 = yellow 3 = buff 4 = tan

[ ] Secondary color: } 5 = brown 6 = pink 7 = red 8 = purple
9 = blue 10 = black 11 = other (specify) _____

[1] Color Pattern: 1 = none 2 = splashed 3 = mottled 4 = striped 5 = flecked 6 = dotted

[ ] Secondary color location: 1 = hilar ring 2 = ventral surface
3 = sides 4 = dorsal surface
5 = not restricted to any area 6 = combination of location (specify below)

_____

[ ] Hilar ring on colored seeds: 1 = absent 2 = narrow 3 = butterfly shaped

8. SEED SHAPE AND SIZE:

[2] Hilum view: 1 = elliptical 2 = oval 3 = round [2] Cross section: 1 = elliptical 2 = oval 3 = cordate 4 = round

[1] Side view:

1 = oval to oblong

2 = round

3 = reniform

8100056

8. SEED SHAPE AND SIZE: (Cont'd)

[1] 1 = truncate ends 2 = rounded ends

[3][2] gm/100 seed

[ ][2] gm/100 seed lighter than Great Northern STAR ..... [ ]

gm/100 seed same as Great Northern UI59 .... [ ]

[1][3] gm/100 seed heavier than Sanilac.. (Navy Bean) [ ]

comparison variety from page one

9. ANTHOCYANIN: (1 = absent 2 = present)

[1] Flowers [1] Stems [1] Pods [1] Seeds [1] Leaves

10. DISEASE RESISTANCE (0 = not tested 1 = susceptible 2 = resistant):

[0] Anthracnose (specify race below) _____

[0] Rust (specify race below) _____

[0] Powdery mildew

[0] Fusarium root rot

[0] Pythium root rot

[0] Rhizoctonia root rot

[0] Pythium wilt

[0] Angular leaf spot

[0] Bacterial wilt

[2] Halo blight (specify race below) Race 1 and 2

[2] Fuscous blight

[0] Red node virus

[0] Pod mottle virus

[2] Bean common mosaic virus (specify strain below) common strain and Ny-15

[0] Mosaic mottle

[0] Black root

[1] Bean yellow mosaic virus

[0] Curly top

[2] Other (specify below) common blight pea strain - Bean yellow mosaic virus

11. INSECT RESISTANCE: (0 = not tested 1 = susceptible 2 = resistant)

[0] Aphids

[0] Leaf hopper

[0] Lygus

[0] Pod borer

[0] Root knot nematode

[0] Seed corn maggot

[0] Thrips

[0] Weavils

[ ] Other (specify below) _____

12. PHYSIOLOGICAL RESISTANCE: (0 = not tested 1 = susceptible 2 = resistant)

[0] Heat [0] Cold [0] Drought [0] Air pollution

13. COMMENTS: